The background of the slide is a dark blue-grey color. It features a faint, light-grey map of the United States. Overlaid on the map is a compass rose in the lower-left quadrant, with a dollar sign (\$) positioned near its base. The text is centered and rendered in a large, bold, yellow font with a black outline.

Geospatial Techniques for the Improved Accuracy and Efficiency in Cultural Resource Prospection and Site Recording

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University of North Dakota

The Problem in Cultural Resource Management.

Shovel Testing



Pedestrian Survey



Lack of Accuracy
in Mapping

Increasing Accuracy and Efficiency

► Predictive Modeling

- Reduces the amount of fieldwork needed to be done by focusing investigation on areas of high probability
- Increases the number of resources identified by allowing investigations to focus on areas of higher resource probability.

► Remote Sensing

- Archival data is available for future investigations
- Is not destructive
- Photogrammetry
- Improves the ability to locate cultural resources
 - View the environment from a different perspective (Kvamme 2007)
 - View the landscape in wavelengths beyond visible light
 - Can make microtopographic features visible using stereo pairs (Markussen et al. 2004).

Low Altitude Remote Sensing: A Renewal

Low altitude remote sensing has the possibility of identifying more cultural resources than other alternatives because of its increased spatial resolution. In addition to this there is the advantage of the lower cost of data.

► UAV

■ Pros

- Can be equipped with a GPS/INS system allowing the vehicle to navigate with a high level of accuracy (within 10cm) (Eisenbeiss 2004).
- Can cover large areas autonomously (croptcam.com)

■ Cons

- Still a relatively high cost, especially for thesis work.
- Requires training to operate
- Use can be limited based on aviation regulations

Low Altitude Remote Sensing: A Renewal

Low altitude remote sensing has the possibility of identifying more cultural resources than other alternatives because of its increased spatial resolution. In addition to this there is the advantage of the lower cost of data.

► Blimp

■ Pros

- Low Cost
- Ease of use
- Stability in calm conditions

■ Cons

- Susceptibility to high winds (Gomez-Lahoz and Gonzales-Aguilera 2009)
- Need to carry compressed gas
- Helium is relatively expensive

Low Altitude Remote Sensing: A Renewal

Low altitude remote sensing has the possibility of identifying more cultural resources than other alternatives because of its increased spatial resolution. In addition to this there is the advantage of the lower cost of data.

► Kite

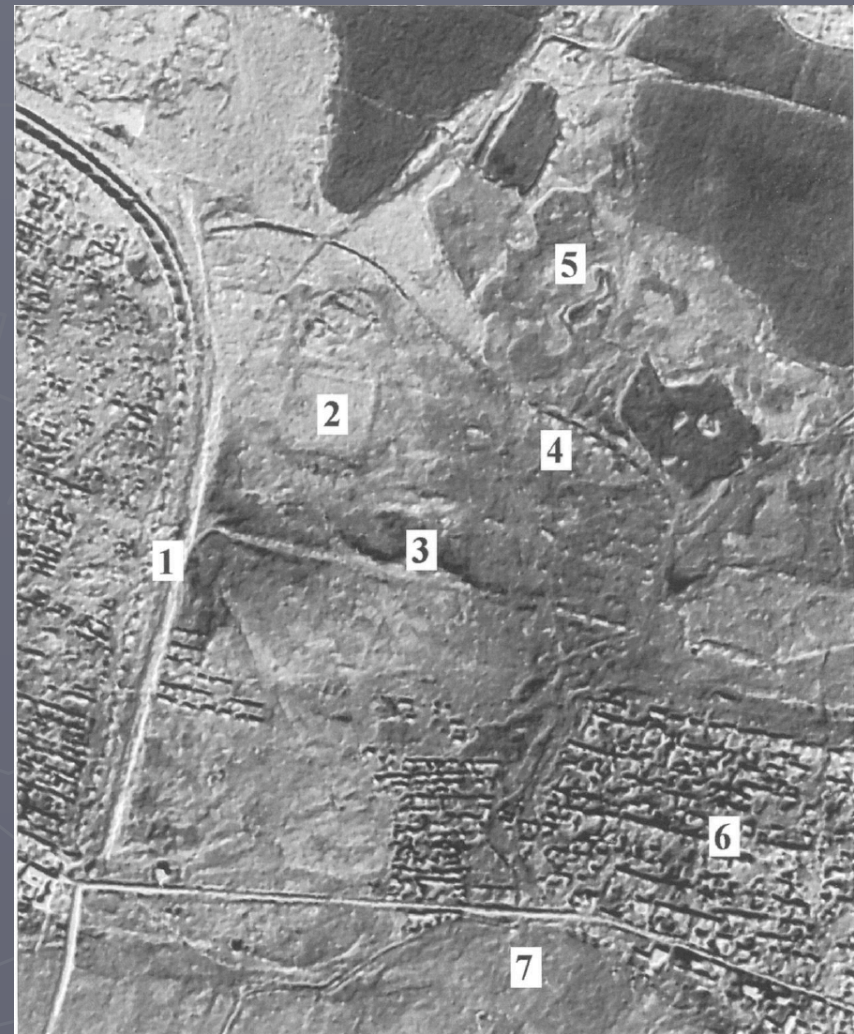
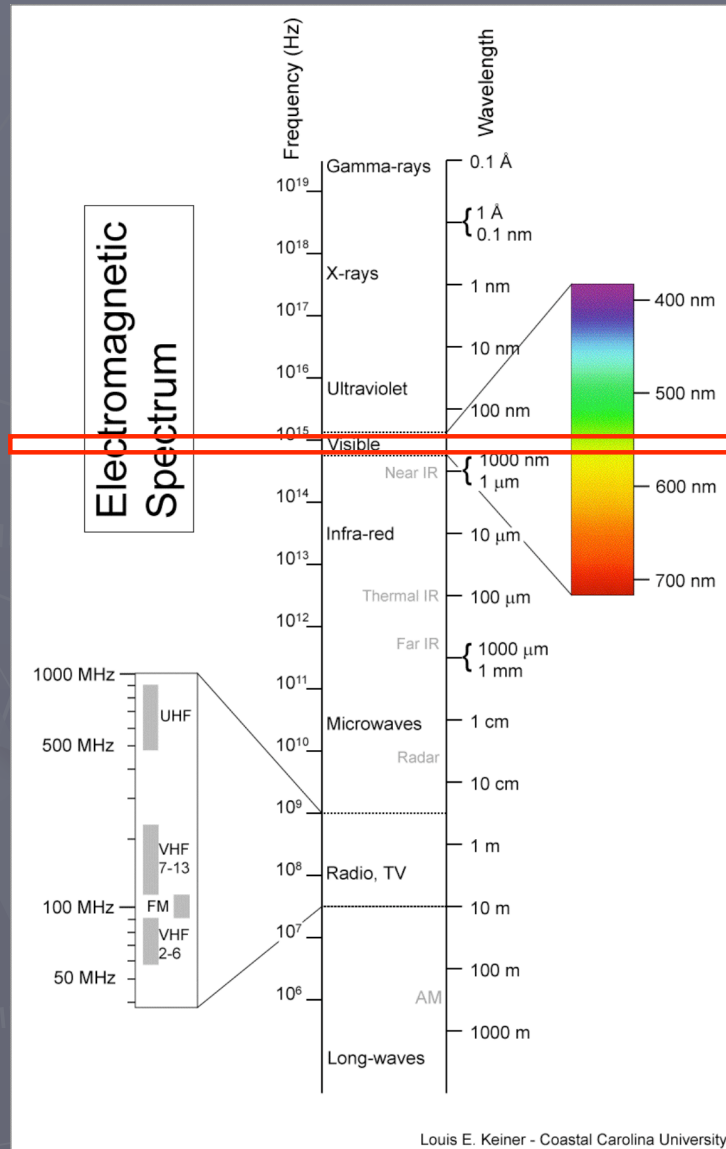
■ Pros

- Low Cost
- Easy to transport
- Can (obviously) operate in winds

■ Cons

- Needs wind to operate (No shortage in North Dakota)
- Difficult to determine sensor altitude and therefore resolution
- The platform is relatively unstable

Color and Panchromatic



(Challis et al. 2002)

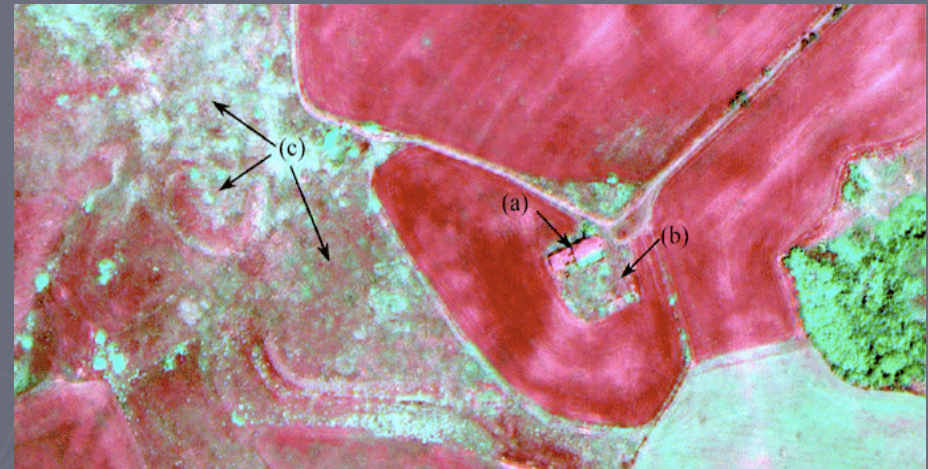
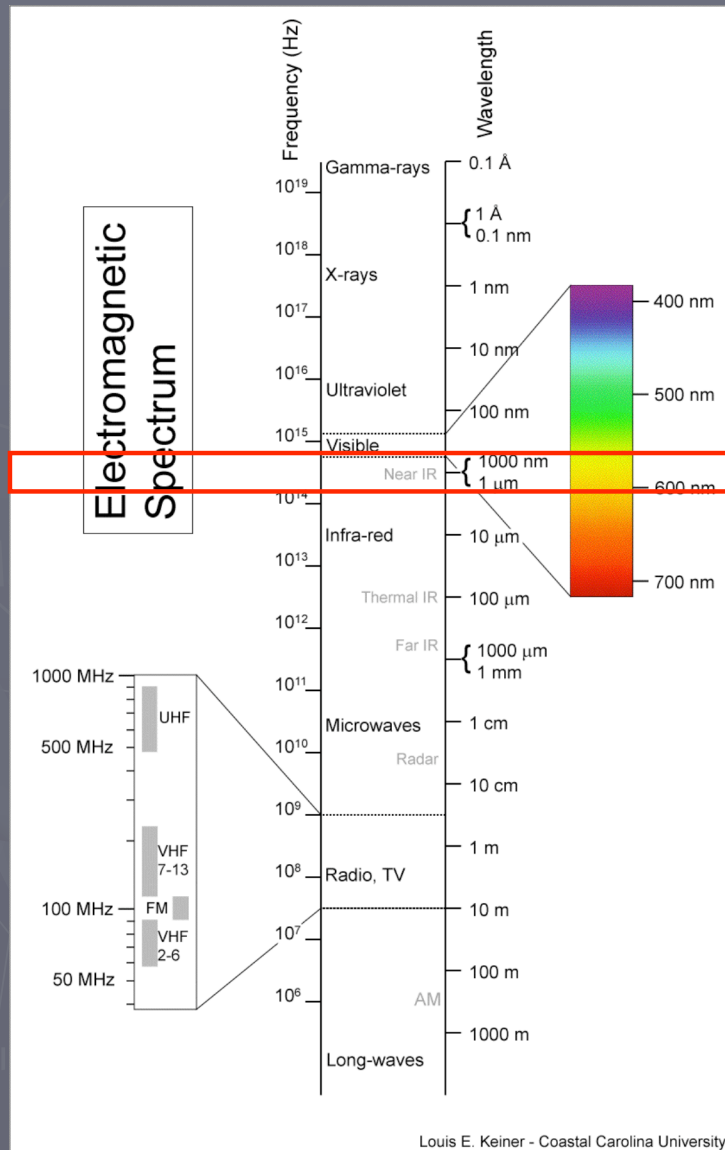
Color and Panchromatic

- ▶ Changes in soil color
- ▶ Shadow marks
- ▶ Crop marks

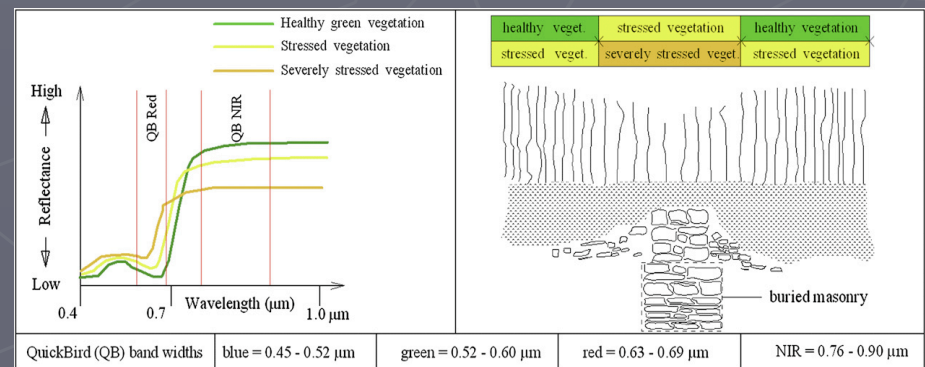


(Challis et al. 2002)

Near-Infrared



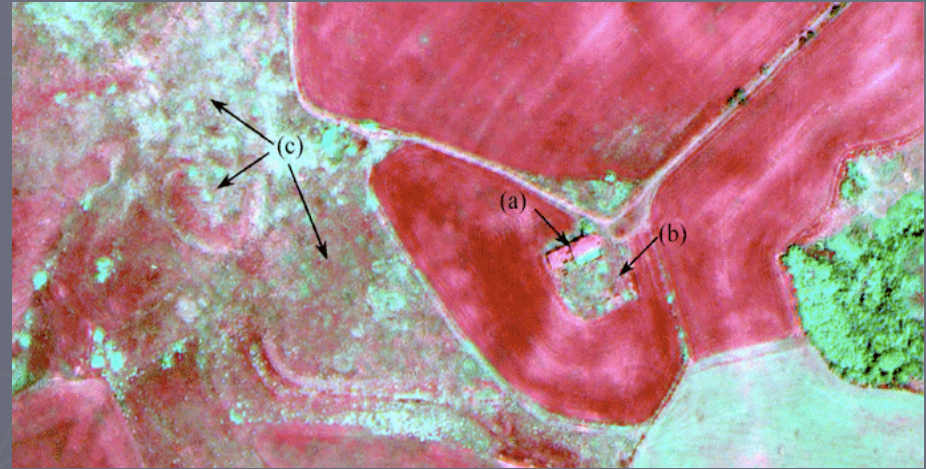
(Lasaponara and Masini 2007)



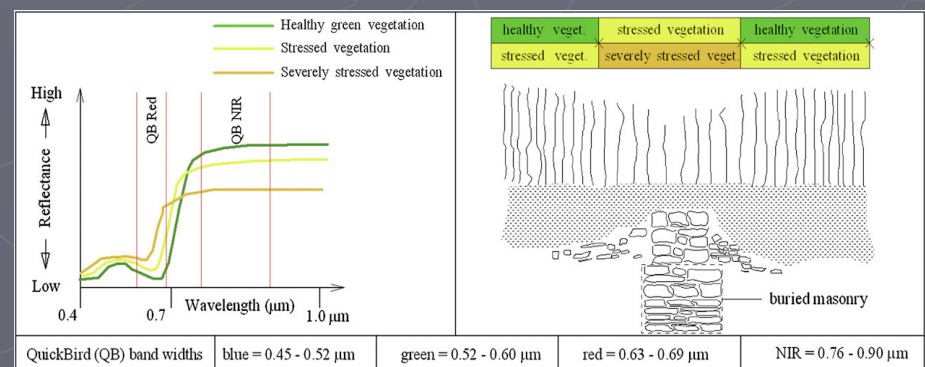
(Lasaponara and Masini 2007)

Near-Infrared

- It is especially sensitive to changes in the phenological state of vegetation which is dependent upon subsurface features (Masini and Lasaponara 2007).

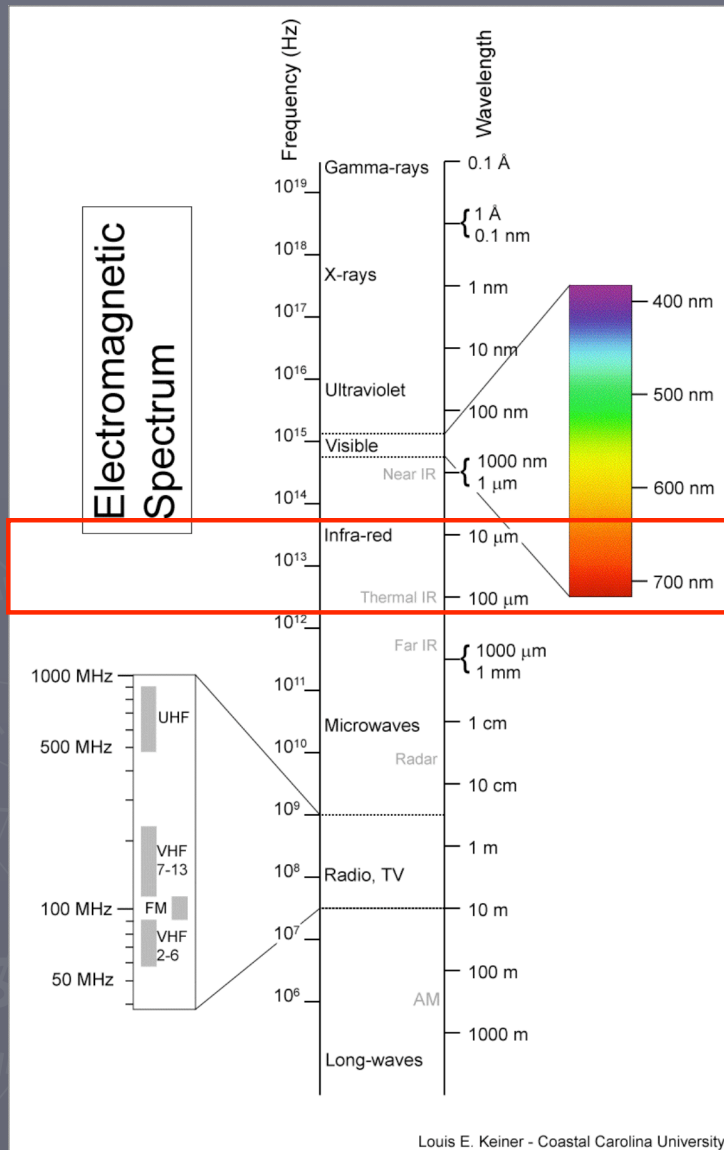


(Lasaponara and Masini 2007)



(Lasaponara and Masini 2007)

Thermal Infrared



(Kvamme, Hailey and Kvamme 2004)

Thermal Infrared

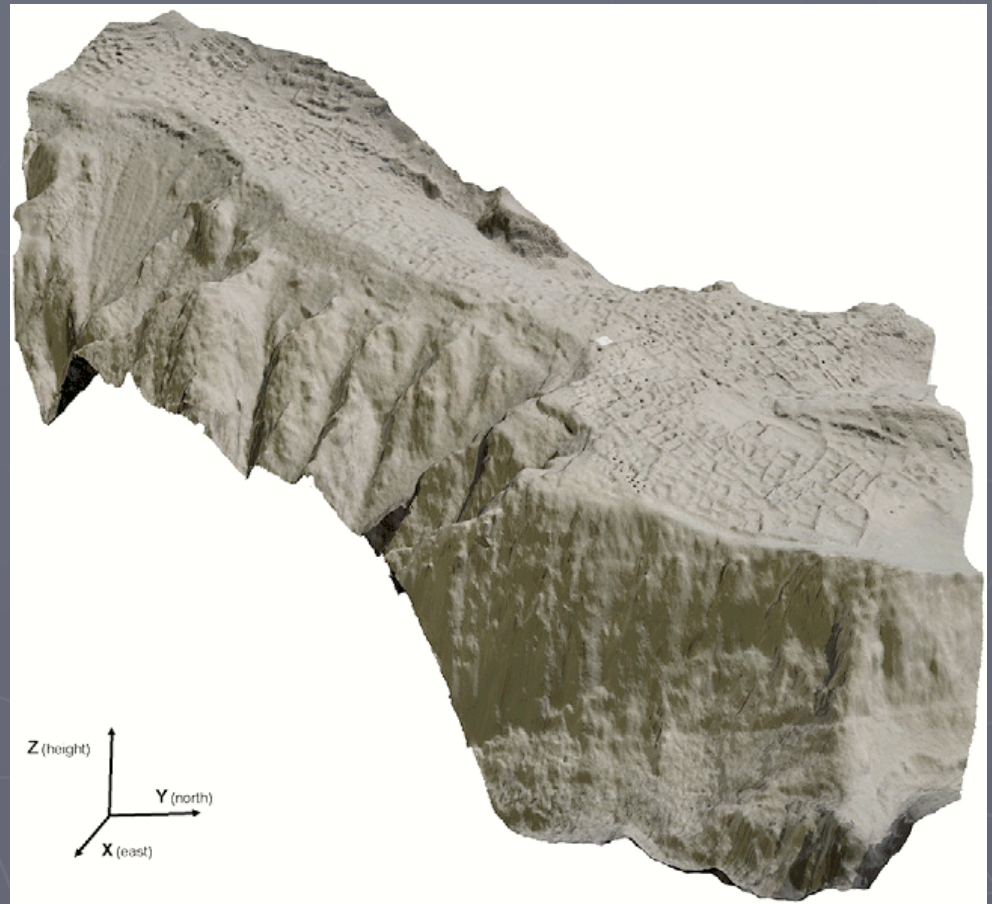
- ▶ Emitted radiation
 - Sun's photons are absorbed by the ground, and subsurface features cause differences in the rate that photons travel outward.



(Kvamme, Hailey and Kvamme 2004)

Stereo Pair Digital Elevation Models

- Can construct high resolution DEMs to identify micro topographic features



(Lambers et al. 2007)

Georeferencing

Control points are placed on the ground of the area being remotely sensed, and their location is recorded based on a datum. The control points in the image are then georeferenced to the image.

- ▶ GPS
- ▶ Transit
- ▶ Pythagorean triples
 - 3:4:5
 - 5:12:13



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